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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/491,585	01/25/2000	Takuya Noguchi	49543(904)	8721

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EXAMINER
QI, ZHI QIANG

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 06/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/491,585	NOGUCHI ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communicati n appears on the cover sheet with the c rrespondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 April 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 5,537,235 (Ishihara et al) and US 4,526,818 (Hoshikawa et al).

Claims 1, 2 and 12, AAPA discloses (page 2, lines 9 -19) that a liquid crystal display device having two insulating substrates bonded to each other via a sealing material, and liquid crystal is filled into a gap between the substrates.

AAPA does not expressly disclose that a cell gap is formed so as to gradually increase from a center to an end of a display area at room temperature to eliminate the irregular color display at a high temperature due to the thermal expansion coefficients difference between the liquid crystal and the sealing material.

However, Ishihara discloses (col.8 line 30 – col.9, line 26; Figs.4A, 4B) that a gap between the electrodes (32a, 32b) at an edge portion (52) of a displaying portion (50) of the liquid crystal display apparatus is increased gradually to prevent development of unevenness in display at the edge portion, which caused by the temperature increased at the edge portion, and the substrates (31a, 31b) have a larger gap at its peripheral

portion (53) than at its middle portion (51) and such that the gap is gradually increased at the edge portion (52) of displaying portion (50). Ishihara discloses the same principle as this application claimed so as to eliminate the unevenness display including the irregular color display caused by the temperature increase such as the edge backlight.

AAPA discloses (page 4, line18 – page 6, line 4; Figs. 13-14) that the coefficient of thermal expansion of a liquid crystal (53) is larger by one digit than that of a sealing material (54), so that an expansion amount of the liquid crystal (53) is larger than that of the sealing material (54), and consequently, the center of the liquid crystal cell expands upward and downward, and the cell gap results in an irregular display color. According to this principle, to overcome this kind of upward and downward expansion of the liquid crystal material so as to maintain a uniform cell gap at higher atmospheric temperature, those skilled in the art would use a contrary compensation for the thermal expansion to form the cell gap gradually increase from the center to the end of the display area at room temperature, so that the liquid crystal material would expanse upward and downward to compensate the thermal expansion effect at the higher atmospheric temperature, therefore, maintaining a uniform cell gap at a higher atmospheric temperature.

Ishihara discloses the cell gap is increased gradually at the edge portion of the display area, but Ishihara does not expressly disclose the cell gap is increased gradually from a center to an end of a display area at room temperature.

However, Hoshikawa discloses (col.8, line 27 – col.9, line 43; Fig.8) that using flexible material such as plastic film to form a curved substrates as shown in Fig.8, and

that would be the cell gap is increased from a center to an end of a display area so as to obtain a uniform cell thickness over the entire surface of the display panel.

Therefore, it would have been obvious to those skilled in the art to arrange a cell gap is smaller in a center (middle portion) than the other part of the display area and gradually increase from the center to an end of the display area as claimed in claims 1,2 and 12 for achieving a uniform cell gap over the entire surface of the display panel and eliminating the unevenness display at a higher atmospheric temperature.

3. Claims 3-7 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA, Ishihara and Hoshikawa as applied to claims 1, 2 and 12 above, and further in view of US 6,104,467 (Nakahara et al).

Claims 3-4, Nakahara discloses (col.2, lines 19-24) that the accuracy of the cell gap uniformity inside the display region exerted on the display quality is especially significant particularly in the case of the STN type liquid crystal display device requiring a surface flatness of not greater than 0.05 μm. Therefore, it would have been obvious to those skilled in the art at the time the invention was made to set the cell gap in the center part less than an average value of cell gaps on an end at room temperature 0.13 μm or 0.08 μm as claimed in claims 3-4 for achieving the accuracy of the cell gap uniformity.

Claims 5-7, as the explanation of the AAPA above, those skilled in the art would use a contrary compensation for the thermal expansion to form the cell gap gradually increase from the center to an end of the display area at room temperature, such that the liquid crystal material would expanse upward and downward to compensate the

thermal expansion effect at the higher atmospheric temperature, and maintaining a uniform cell gap at a higher atmospheric temperature; or, on the contrary, to form the cell gap gradually decrease from the center to the end of the display area at a high temperature, such that the liquid crystal material would expanse downward and upward to compensate the thermal expansion effect at the room temperature, and maintaining a uniform cell gap at room temperature; and that would be depended on the making process, and that would have been an obvious variation.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange a cell gap gradually increase or gradually decrease from the center to the end of the display area as claimed in claims 5-7 for achieving a uniform cell gap at a higher atmospheric temperature or at room temperature depending on the making process.

Claim 10, Nakahara discloses (col. 1, lines 6-14) that the super twisted nematic (STN) type liquid crystal display device used as a color display requiring high cell gap accuracy, so that using STN liquid crystal as color display device that is a basic requirement, and that would have been at least obvious.

Claim 11, AAPA discloses (col.2, line 1-3) that the operating temperature of the liquid crystal display device generally needs to be set between –20 and 70° C in view of using outdoor or in an automobile. Therefore, it would have been obvious to those skilled in the art at the time the invention was made to set the operating temperature ranges virtually between –20 and 70° C as claimed in claim 11 for the outdoor using or automobile using.

4. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA, Ishihara and Hoshikawa as applied to claims 1, 2 and 12 above, and further in view of US 6,104,467 (Nakahara et al) and US 6,327,011 (Kim).

Claims 8-9, Nakahara discloses (col.6, lines 31-32) that the glass substrates are used and plastic substrates also can be used, and that would have been at least obvious. Concerning the thickness of the substrates, Kim discloses (col.3, lines 34-35; col.2, lines 56-63) using thickness less than 0.7 mm for the substrates. If the substrates were very thin, the substrates would be very easy to be crack. If the substrates were very thick, the liquid crystal display device would get more weight. Therefore, it would have been obvious to those skilled in the art at the time the invention was made to select a proper thickness for the substrate as claimed in claims 8-9 to use 0.55 mm thickness for the substrates.

Response to Arguments

5. Applicant's arguments filed on Apr.23,2003 have been fully considered but they are not persuasive.

Applicant's **only** arguments are as follows:

1) The references Ishihara, Hoshikawa combined with conventional are concerning the different of coefficients of thermal expansion between materials could not arrive the present invention.

2) The reference Hoshikawa merely teaches a flexible substrate, and does not teach the cell gap increased gradually, and the working temperatures are in the range of 0-40°C not considering the operation at high temperature of 60-70°C.

3) The references Nakahara and Kim do not teach the cell gap increased gradually from the center to the end of the display area at room temperature.

Examiner's responses to Applicant's **only** arguments are as follows:

1) The reference Ishihara discloses (col.8 line 30 – col.9, line 26; Figs.4A, 4B) that a gap between the electrodes (32a, 32b) at an edge portion (52) of a displaying portion (50) of the liquid crystal display apparatus is increased gradually to prevent development of unevenness in display at the edge portion, which caused by the temperature increased at the edge portion, and the substrates (31a, 31b) have a larger gap at its peripheral portion (53) than at its middle portion (51) and such that the gap is gradually increased at the edge portion (52) of displaying portion (50). Ishihara discloses the same principle as this application claimed so as to eliminate the unevenness display including the irregular color display caused by the temperature increase such as the edge backlight.

The conventional are AAPA discloses (page 4, line18 – page 6, line 4; Figs. 13-14) that the coefficient of thermal expansion of a liquid crystal (53) is larger by one digit than that of a sealing material (54), so that an expansion amount of the liquid crystal (53) is larger than that of the sealing material (54), and consequently, the center of the liquid crystal cell expands upward and downward, and the cell gap results in an irregular display color. According to this principle, to overcome this kind of upward and downward

expansion of the liquid crystal material so as to maintain a uniform cell gap at higher atmospheric temperature, those skilled in the art would use a contrary compensation for the thermal expansion to form the cell gap gradually increase from the center to the end of the display area at room temperature, so that the liquid crystal material would expanse upward and downward to compensate the thermal expansion effect at the higher atmospheric temperature, therefore, maintaining a uniform cell gap at a higher atmospheric temperature.

Hoshikawa discloses (col.8, line 27 – col.9, line 43; Fig.8) that using flexible material such as plastic film to form a curved substrates as shown in Fig.8, and that would be the cell gap is increased from a center to an end ~~of a dis~~play area so as to obtain a uniform cell thickness over the entire surface of the display panel.

Therefore, it would have been obvious to those skilled in the art to arrange a cell gap is smaller in a center (middle portion) than the other part of the display area and gradually increase from the center to an end of the display area as claimed in claims 1,2 and 12 for achieving a uniform cell gap over the entire surface of the display panel and eliminating the unevenness display at a higher atmospheric temperature

2) Although the reference Hoshikawa teaches flexible substrate and the working temperatures are in the range of 0-40°C, but Hoshikawa is a secondary reference that shows the cell gap can be arranged gradually increased from the center to the end of a display area as shown in the Fig.8, and according to the thermal expansion principle explained above to obtain a uniform cell thickness over the entire

surface of the display panel. Concerning the operation temperature range as the conventional art AAPA indicated (col.2, line 1-3) that the operating temperature of the liquid crystal display device generally needs to be set between –20 and 70° C in view of using outdoor or in an automobile. Therefore, it would have been obvious to those skilled in the art at the time the invention was made to set the operating temperature ranges virtually between –20 and 70° C for the outdoor using or automobile using.

3) The references Nakahara and Kim are secondary references, and disclose about the cell gap thickness and the substrate thickness requirements.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (703) 308-6213.

9. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Mike Qi
May 12, 2003

ROBERT H. KIM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800